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Division

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Section

SUPERFUND

Program

IHS (IHS)

DocCat

FACILITY

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JUN 2 4 2009

UST Section Mooresville Regional Office Active Remediation Monitoring Report Former Skippers Marina 1156 Perth Road Troutman, North Carolina

DENR Incident Number 22425

H&H Job No. KID.002

June 23, 2009



2923 South Tryon Street Suite 100 Charlotte, NC 28203 704-586-0007

3334 Hillsborough Street Raleigh, NC 27607 919-847-4241

Title Page

RECEIVED NCDENR Division of Waste Management

Site Information:

Former Skippers Marina 1156 Perth Road Troutman, North Carolina Groundwater Incident No. 22425 Lat. N 35° 18' 54" Long. W 77° 47' 41"

JUN 2 4 2009

UST Section Mooresville Regional Office

Risk Classification:

High (water supply wells located within 1,000 ft of source area)

Land Use:

Subject property is commercial and used to fabricate docks and boat lifts. Surrounding properties are residential and site is bordered by Lake Norman.

Property Owner:

Marlan Properties Inc. 1156 Perth Road Troutman, North Carolina, 28166 (704) 528-7400

UST Operator:

Mr. John Kindley 114 Morlake Drive, Suite 102 Mooresville, North Carolina 28117 (704) 799-9202

Consultant:

Hart & Hickman, PC 2923 South Tryon Street, Suite 100 Charlotte, NC 28203 (704) 586-0007

Release Information:

Date of Release Discovery = January 2001 Quantity of Release = Unknown Source of Release = UST and/or Associated Piping Material Released = Unleaded Gasoline

Laboratory: Prism Laboratories, Inc., NC Certification No. 402.

I, <u>Matt Bramblett</u>, a Principal and Licensed Engineer for Hart & Eickman certify that the information contained in this report is correct and accurat my knowledge.

<u>Hart & Hickman, PC</u> is licensed to practice geology and engineering in The certification numbers are C-245 and C-1269, respectively.

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Active Remediation Monitoring Report

Former Skippers Marina Troutman, North Carolina

1.0 Introduction

On behalf of Mr. John Kindley, Hart & Hickman, P.C. (H&H) has prepared this Active Remediation Monitoring Report for the former Skippers Marina located at 1156 Perth Road in Troutman, Iredell County, North Carolina. A site location map and a site plan are included as Figures 1 and 2, respectively. The property is currently occupied by Lancaster Custom Dock and Lift Systems, Inc. The North Carolina Department of Environment and Natural Resources (DENR) incident number for the site is 22425, and DENR has assigned the site a high-risk classification due to the presence of nearby water supply wells. This report documents baseline groundwater sampling performed by H&H in April 2009, remediation system installation, and first month of remediation system operation.

2.0 Site History

A 5,000-gallon kerosene underground storage tank (UST), four gasoline UST's ranging in size from 5,000 to 10,000 gallons and associated piping/dispensers were removed in January 2001. An initial assessment was conducted and 269 cubic yards of petroleum-impacted soil were removed from the former UST area. No free product was encountered during UST removal.

A Corrective Action Plan (CAP) was submitted to DENR by others in July 2002 which recommended groundwater remediation using an air sparge/soil vapor extraction (AS/SVE) system. The objective of the corrective action was to remediate groundwater in the unconsolidated sediments of the shallow aquifer. Due to Trust Fund prioritization, the remediation system installation was delayed.

DENR issued a letter to Mr. John Kindley dated August 20, 2008 requesting site remediation. In response to the DENR letter, H&H provided a letter dated October 6, 2008 modifying the proposed AS/SVE system layout by taking into consideration recent groundwater results. The proposed AS/SVE system was designed and bid specifications were issued December 15, 2008. Trust Fund pre-approval for the proposed AS/SVE system was obtained.

The AS/SVE system was installed during March and April 2009 with SVE system start-up on April 27, 2009. The AS system start-up occurred on May 4, 2009. The remediation system is comprised of ten SVE wells; seven AS wells; and associated piping, remediation system building and equipment. The SVE system utilizes a Rotron regenerative blower while the sparge air is supplied by a Gardner Denver Endurair air compressor.

3.0 Summary of Potential Receptor Information

3.1 Water Supply Wells

A water supply receptor survey was conducted by others in March 2001 for the area within a 1,500-ft radius of the source area. The survey was conducted by performing area reconnaissance and checking for municipal water connections. The results of the survey indicated that municipal water is not provided to the site or available to the properties within a 1,500-foot radius of the site.

Fourteen water supply wells were located within 1,000 ft of the source area. An additional twenty seven potential water supply wells were observed on properties located between approximately 1,000 and 1,500 ft of the source area. The on-site supply well WSW-12 is in use, but it is not used for drinking water according to Mr. Mark Lancaster. The water supply well owner information and well location map are included in Appendix A.

3.2 Surface Water

The nearest surface water is Lake Norman which is located approximately 100 ft to the south of the source area (Figure 2). There are monitoring wells without detectable impacts between the lake and the petroleum ground water plume.

4.0 Groundwater Sampling

4.1 Water Levels

On April 3, 2009, H&H gauged water levels in the site monitoring wells (Table 1). No free product was detected in any of the site monitoring wells. The estimated water table elevations in April 2009 are depicted in Figure 3. Because the potentiometric groundwater surface map does not correlate well with historical groundwater plume migration, H&H intends on re-checking monitor well top of casing elevations using surveying techniques in June or July 2009.

4.2 Monitoring Well and Water Supply Well Analytical Data

To determine baseline ground water conditions prior to remediation system start-up, monitoring wells MW-1, MW-2, MW-3, MW-5B, MW-6B, MW-7, MW-8, MW-9, MW-10 MW-11, MW-12, MW-13, MW-15B, TW-1 and water supply well WSW-12 were sampled on April 3, 2009. TW-1 is a deeper Type III monitoring well. Prior to sampling, monitor wells were purged until pH, temperature, and conductivity stabilized. Groundwater samples were then collected using dedicated polyethylene bailers, poured in laboratory supplied containers, marked with identifying labels, and placed in an iced cooler for shipment under chain-of-custody to a certified laboratory for analyses. The site supply well WSW-12 was sampled from a spigot located near the supply well after allowing the water to run for approximately 15 minutes. Water samples were analyzed for volatile organic compounds (VOCs) by Standard Method 6200B (Table 2).

No petroleum-related impacts were detected in the on-site water supply well. Petroleum-related impacts were detected above groundwater standards in monitoring wells MW-1, MW-5B, MW-8, MW-9, MW-11 and WSW-12. The highest concentrations were detected in monitoring well MW-5B, which is located just downgradient of the source area. Benzene was detected in MW-5B at a concentration of $4{,}000 \,\mu\text{g/l}$.

Isoconcentration maps of BTEX, benzene, xylenes and methyl tertiary butyl ether (MTBE) in shallow groundwater wells are included as Figures 4 through 7, respectively. The plume maps indicate that impacted groundwater is generally limited to the area within the subject site property boundaries. However, a low concentration of benzene (3.6 µg/l) was detected in off-site well MW-11 compared to the ground water standard of 1 µg/l. Benzene has not historically been detected in MW-11. A low concentration of MTBE (210 µg/l) was detected in off-site well MW-8 compared to the ground water standard of 200 µg/l. Historical groundwater sampling results obtained by others are contained in Appendix C.

In addition to petroleum related compounds, low levels of the solvent tetrachloroethene (PCE; up to 2.5 μ g/l) were detected in two monitoring wells east of Perth Road (MW-8 and MW-9). In addition, 0.71 μ g/l of PCE was detected in the water sample collected from the on-site water supply well WSW-12. The groundwater standard for PCE is 0.7 μ g/l. The source of the PCE detections is unknown.

Sampling results indicate that deeper groundwater is not impacted at the site. No impacts were detected in a ground water sample collected from deeper well TW-1.

5.0 Remediation System Installation and Startup

The SVE/AS remediation system was installed during March and April 2009 with system start-up on April 27, 2009. The remediation system layout is provided in Figure 8. The SVE system consists of ten four-inch diameter SVE wells (SVE-1 through SVE-10). SVE-1 was previously installed to a depth of 8 ft with a 6 ft section of well screen. The other SVE wells were installed to a depth of 9 ft with a 5 ft section of 0.010 slot screen. The SVE wells are divided into two "fields" to increase overall system effectiveness. Four SVE wells are tied into one field and are installed in the former tank basin, while six SVE wells are installed as a separate field. The vacuum to each of the two fields can be independently controlled, and air flow from each field can be independently measured. The SVE system utilizes a Rotron 5.0 hp regenerative blower (Model EN 707) rated at 240 cubic feet per minute (cfm) of air at a vacuum of 30 inches of water.

The air sparge system consists of seven two-inch diameter air sparge wells (AS-1 through AS-7). AS-1 was previously installed to a depth of 25 ft with a 3 ft section of well screen. The other AS wells were installed to a depth of 30 ft with a 5 ft section of 0.010 well screen. The air sparge system utilizes a Gardner Denver 7.5 hp (Endurair) rotary screw compressor rated at 29 cfm at 100 pounds per square inch (psi). The AS wells are being run continuously, but they can be cycled for preset lengths of time in the future if desired.

The remedial well boring logs and well construction records are provided in Appendix D with the exception of SVE-1 and AS-1. These two wells were previously existing SVE/AS pilot test wells installed by others that were incorporated into the new remediation system.

Both systems are designed to operate continuously unless the SVE system shuts down. If this takes place, the AS system will automatically cease operation until the SVE system is automatically or manually restarted.

H&H monitored the performance of the SVE/AS system by conducting weekly operation & maintenance (O&M) visits for the first month. Going forward, the O&M visits will be once per month. The SVE system operation status, number of hours of operation, inlet vacuum, air flow, and air discharge organic vapor analyzer readings are recorded (Table 3). In addition, the AS system operation status, number of hours of operation, compressor pressure, air flow to each well, and air pressure to each well are recorded (Table 4). An O&M log sheet is completed during each site visit and kept in a bound folder.

An air sample was collected from the SVE system off-gas on May 11, 2009 to help gauge the systems effectiveness (Appendix E). SVE System off-gas concentrations and mass removal rates are presented in Tables 5 and 6. Initial data indicate that 127 pounds of petroleum hydrocarbons were removed in the first 14 days. Based on the data and information collected during O&M visits, the AS/SVE remedial system appears to be operating as designed since system start-up on April 27, 2009.

IJ

6.0 Conclusions and Recommendations

The former Skippers Marina facility site is a high risk site due to the existence of an onsite water supply and additional water supply wells within 1,000 ft of the source area. DENR issued a letter to Mr. John Kindley dated August 20, 2008 requesting site remediation. In response to the DENR letter, H&H provided a letter dated October 6, 2008 modifying the originally proposed AS/SVE system layout by taking into consideration recent groundwater results. The proposed AS/SVE system was designed and bid specifications were issued December 15, 2008. Trust Fund pre-approval for the proposed AS/SVE system was obtained.

To determine baseline ground water conditions, site monitoring wells were sampled on April 3, 2009. Petroleum impacted groundwater extends from the former UST basin primarily to the east. No petroleum-related impacts were detected in the on-site water supply well. Petroleum-related impacts were detected above groundwater standards in five monitoring wells. The highest concentrations were detected in monitoring well MW-5B, which is located just downgradient of the source area. Benzene was detected in MW-5B at a concentration of 4,000 μ g/l.

The AS/SVE system was installed during March and April 2009 with SVE system start-up on April 27, 2009. The AS system start-up occurred on May 4, 2009. The remediation system is comprised of ten SVE wells; seven AS wells; and associated piping, remediation system building and equipment. Initial data indicate that 127 pounds of petroleum hydrocarbons were removed in the first 14 days.

Based on the results of the baseline groundwater sampling event, H&H recommends continued operation of the AS/SVE remediation system. Additionally, H&H recommends quarterly groundwater sampling of monitor wells and the on-site water supply well for the first year of system operation and semi-annually thereafter. The next quarterly groundwater and remediation system

off-gas sampling event will be conducted in July 2009 with an Active Remediation Monitoring Report to be submitted in August 2009.

Table 1
Monitoring Well Summary
Former Skippers Marina
Troutman, North Carolina
H&H Job No. KID-002

					Novem	ber 19, 2008	April 3, 2009		
	Well TOC	Total	Well		TOC Water	Water Table	TOC Water	Water Table	
Monitoring Well	Elevation	Depth	Diameter	Screen Length	Table Depth	Elevation	Table Depth	Elevation	
Identification	(ft)	(ft)_	(in)	(ft)	(ft)	(ft)	(ft)	(ft)	
MW-I	100.00	18.0	2.0	15	9.13	90.87	8.41	91.59	
MW-2	101.97	20.0	2.0	15	10.93	91.04	10.22	91.75	
MW-3	98.37	18.0	2.0	15	7.46	90.91	6.69	91.68	
MW-5B	97.51	16.0	2.0	10	8.02	89.49	7.26	90.25	
MW-6B	90.98	11.5	2.0	10	1.88	89.10	0.92	90.06	
MW-7	96.88	15.0	2.0	10	7.93	88.95	7.11	89.77	
MW-8	99.13	18.0	2.0	15	8.35	90.78	7.59	91.54	
MW-9	98.60	18.0	2.0	15	7.82	90.78	7.01	91.59	
MW-10	99.97	20.0	2.0	15	9.13	90.84	8.35	91.62	
MW-11	97.96	20.0	2.0	15	14.21	83.75	13.45	84.51	
MW-12	101.48	18.0	2.0	15	10.68	90.80	9.86	91.62	
MW-13	94.34	12.0	2.0	10	3.59	90.75	2.67	91.67	
MW-14	96.38	15.5	2.0	10	12.69	83.69	11.84	84.54	
MW-15B	99.53	20.0	2.0	15	10.06	89.47	9.31	90.22	
TW-I	99.82	43.0	2.0	5	not gauged	not gauged	8.21	91.61	

Notes:

5/21/08 - MW-5B was installed as a replacement for MW-5; MW-6B was installed as a replacement

for MW-4 and MW-6; MW-15B was installed as a replacement for MW-15

DNE = Did Not Exist

TOC = Top of casing

TOC based on arbitrary benchmark of MW-1 at 100-feet

File:Monitoring Well Summary Date:6/23/2009

Table 2
Ground Water Analytical Results
Former Skippers Marina
Troutman, North Carolina
H&H Job No. KID-002

			Method - 6200 B (μg/L)													
Sample ID	Date	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbezene	Benzene	Chloroform	Ethylbenzene	lsopropylbenzene	m.p. and o-Xylenes	МТВЕ	n-Butylbenzene	n-Propylbenzene	Naphthalene	sec-Butylbenzene	Tetrachloroethene	Toluene
NC 2L S	Standard	350	0.38	350	1	70	550	70	530	200	70	70	21	70	0.7	1,000
MW-1	4/3/2009	700	<0.5	200	1,600	<0.5	1,200	39	3,380	<0.5	<1.0	110	400	<0.5	<0.5	2,000
MW-2	4/3/2009	23	<0.5	<0.5	0.7	3.3	<0.5	6.2	12	1.4	1.8	0.85	11	8.3	<0.5	<0.5
MW-3	4/3/2009	1.6	<0.5	<0.5	12	<0.5	24	3.0	3.6	<0.5	1.2	5.4	9.5	1.1	<0.5	2.5
MW-5B	4/3/2009	380	<0.5	160	4,000	<0.5	1,000	42	548	290	<1.0	140	390	<0.5	<0.5	150
MW-6B	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-7	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-8	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	210	<1.0	<0.5	<2.0	<0.5	2.5	<0.5
MW-9	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	2.0	<0.5
MW-10	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	4.2	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-11	4/3/2009	<0.5	9.7	<0.5	3.6	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-12	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-13	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-14	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
MW-15B	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
TW-1	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	<0.5	<0.5
WSW-12	4/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<2.0	<0.5	0.71	<0.5

Notes:

Bold indicates that concentrations exceed the standard Only compounds detected in at least one sample shown above NS = Not sampled

NC 2L Standard=North Carolina Groundwater Quality Standard (15A NCAC 2L .0202)

Only sampled for Volatile Organic Compounds (VOCs)

Table 3
Soil Vapor Extraction System Data
Former Skippers Marina
Troutman, North Carolina
H&H Job No. KID.002

O&M Date	System Running Upon Arrival	Blower Hour Meter	Blower Vacuum ("H₂O)	Field # 1 Air Flow (scfm / "H20)	Field # 2 Air Flow (scfm / "H2O)	Total Air Flow (scfm)	Discharge Temp (°F)	PID Off-Gas Concentration (ppm)	Additional Comments
4/27/2009	No	0.0	54	5.5 / 30"	9.0 / 30"	171	<130	245	Initial start-up of system
5/5/2009	Yes	28.2	54	5.2 / 34	3.6 / 34	168	·130	430	Hour meter rewired since last visit
5/11/2009	Yes	171.4	56	5.2 / 36	3.6 / 36	168	<130	160	Sampled SVE051109 @ 14:30
5/19/2009	Yes	358.8	52-68	5.2 / 55	3.6 / 55	150	135	190	Increased vac to wells after arriving

Notes:

SVE System Started on April 27, 2009 PID = Photo Ionization Detector

NA = Not Available

Table 4
Air Sparge System Data
Former Skippers Marina
Troutman, North Carolina
H&H Job No.KID.002

	System Running			Manifold	Sparge V	Vell AS-1	Sparge V	Vell AS-2	Sparge V	Veil AS-3	Sparge V	Vell AS-4	Sparge V	Vell AS-5	Sparge V	Nell AS-6	Sparge V	Veil AS-7	
M&O	Upon	Compressor	Compressor	Pressure	Air Flow							Pressure	Air Flow	Pressure	Air Flow	Pressure	Air Flow	Pressure	Additional
Date	Arrival	Hour Meter	Pressure (psi)	psi)	(scfm)	(psi)	Comments												
5/5/2009	Yes	30.0	100	35	1.4	6.0	1.5	7.0	1.5	8.0	1.6	8.0	1.5	7.0	1.5	7.0	1.5	8.0	Initial system start-up by Enviro-Equipment, 5/4/09
5/11/2009	Yes	172.0	98	35	1.5	7.0	1.5	9.5	1.6	9.5	1.6	10.0	1.5	9.0	1.5	9.0	1.5	9.0	Collected air sample off SVE Exhaust SVE051109
5/19/2009	Yes	360.0	100	35	1.8	8.0	1.6	9.0	1.5	10.0	1.6	9.0	1.5	8.5	1.5	9.0	1.5	8.0	

Notes: Air sparging system started on May 4, 2009 NA = Not Available

Table 5 Summary of Off-Gas Sampling Results (mg/m3) Former Skippers Marina Troutman, North Carolina H&H Job No. KID.002

Sample ID	SVE051109
Sampling Date	5/11/2009
Analytical method	VOC's (Method 18)
Benzene	<5.0
Ethylbenzene	5.2
Toluene	7
Xylene	3.3
MTBE	<5.0
TRPH	600

Notes:

TRPH = Total recoverable petroleum hydrocarbons

VOCs = Volatile organic compounds

MTBE = methyl tert butyl ether

Table 6 **Estimated Mass Removal Rates** Soil Vapor Extraction/Air Sparge Remedial System Former Skippers Marina Troutman, North Carolina H&H Job No. KID.002

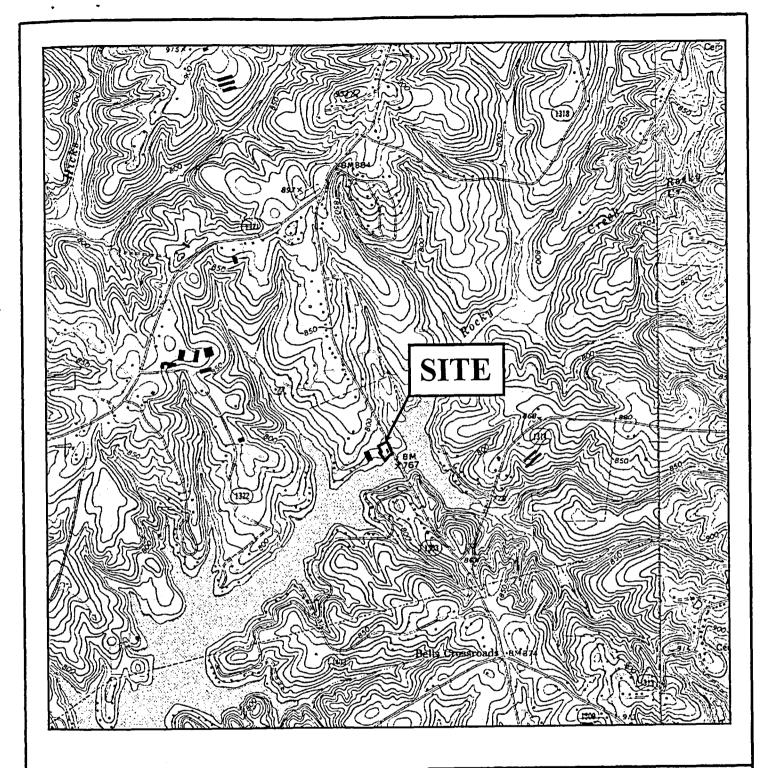
					Off-Gas Analytical Results Estimated						nated Mass	Mass Removal Rate				Estimated Mass Removed During Period						
No. of Days of operation	Dates of operation	Average Flow Rate (scfm)	Off-Gas sample collection date	Benzene (mg/m³)	Toluene (mg/m³)	Ethyl- benzene (mg/m³)			TRPH C4-C10 (mg/m³)		Toluene (lb/day)	Ethyl- benzene (lb/day)	Xylenes (lb/day)	MTBE (lb/day)	TRPH C4-C10 (lb/day)	Benzene (Ib)	Toluene (lb)	Ethyl- benzene (lb)	Xylenes (lb)	MTBE	TRPH C4-C10 (lb)	
14	4/27/2009 to 5/11/2009	168	5/11/2009	<5.0	. 7	5.2	3.3	<5.0	600	0.00	0.11	0.08	0.05	0.00	9.07	0.00	1.48	1.10	0.70	0.00	126.95	
Notos:															Totals	0	11	1	1	0	127	

System start-up was April 27, 2009

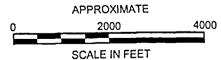
Mass removed = off-gas emission rate X average flow rate (applying appropriate unit conversions)

Totals = daily mass removed X number of days in period

TRPH = Total Recoverable Petroleum Hydrocarbons







U.S.G.S. QUADRANGLE MAP

TROUTMAN, N.C. 1993

QUADRANGLE 7.5 MINUTE SERIES (TOPOGRAPHIC) TITLE

SITE LOCATION MAP

PROJECT

FORMER SKIPPER'S MARINA TROUTMAN, NORTH CAROLINA



DATE:	6-22-09	REVISION NO:	0
JOB NO:	KID-002	FIGURE NO:	1

